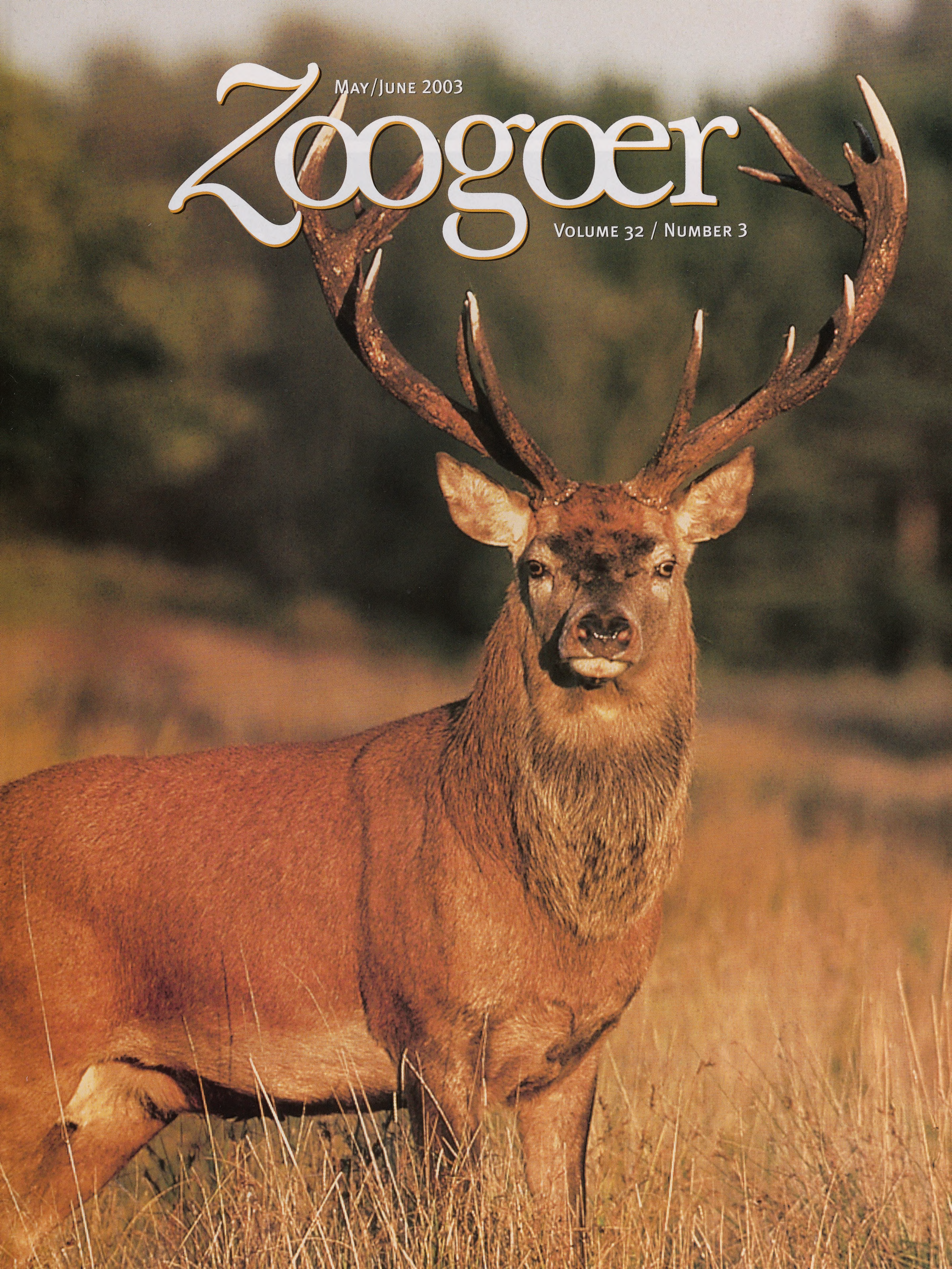


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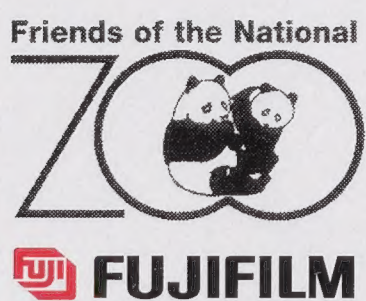
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Some images preserve more than memories.



Partners in Conservation Education

In an effort to secure their future in China and North America, Fujifilm is proud to sponsor the future home of two giant pandas at the Smithsonian's National Zoo. Mei Xiang and Tian Tian will be housed in a state-of-the-art facility under the care of the National Zoo. Fujifilm recognizes that although photography is wonderful for preserving memories, it can never replace the real thing. www.fujifilm.com





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WHAT PULLING A REAL CORK CAN DO

BY MALCOLM SMITH

Synthetic "corks" may put cork growers in an economic twist, as well as cast uncertainty over sustainable farming and wild animal populations in the Spanish "dehesa" and Portuguese "montados."

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BY HOWARD YOUTH

Development and agricultural intensification have driven numbers of many native UK species down, while exotic species have made Britain their home.

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BY MARY-RUSSELL ROBERSON

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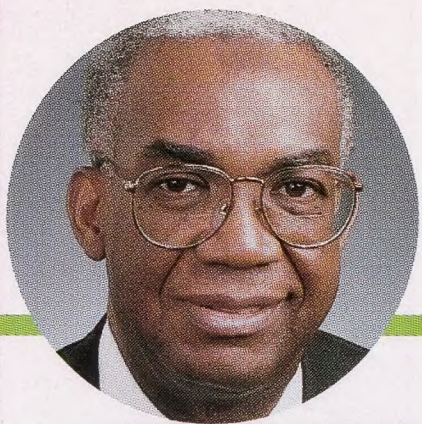
A peafowl from Philly is now the peacock of the walk at the National Zoo; an octopus gets room to stretch its tentacles at the Invertebrate Exhibit; and the Zoo swings with summer fun.

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A new method for using genetically modified crops is the first aimed at helping wild species in the environment; there is bad news for endangered Iberian lynx; and see how Latin and French, dogs and serins all come together in *What's in a Name*.



FONZ FORUM

CALL TO NOMINATIONS

In accordance with our Bylaws, the Friends of the National Zoo Board of Directors is now soliciting nominations from the membership. Our volunteer Board plays an essential role in FONZ leadership and operation, and we rely on our members to recommend candidates with appropriate skills and talents to assist our efforts to support the Smithsonian's National Zoological Park.

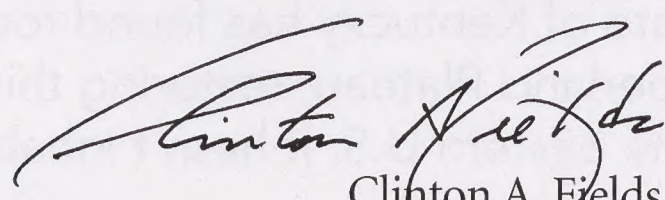
I ask you to help by nominating to the Board persons who are interested in this very special community service. Nominations will be reviewed by the Board's Nominating Committee. The names of selected candidates will be forwarded to the membership for election. The criteria by which potential candidates are judged for nomination to the Board of Directors include: the candidate's strong interest in supporting zoological education, research, and conservation in accordance with the purposes of our corporation; leadership; experience or skills that would directly benefit FONZ management and operations; and the willingness to commit significant amounts of time to participate fully in FONZ work and activities. Candidates must be dues-paying members of FONZ.

Much of the Board's work is accomplished through committees. For example: The Education Committee makes policies and provides guidance for FONZ-supported education, conservation, outreach, and Zoo-supported programs. The Membership and Development Committee develops policies related to membership activities and provides oversight for membership acquisition and retention programs and fundraising for the Zoo. The Guest Services/Concessions Committee formulates policies for FONZ concessions operations and visitor support services. Other Board committees include: Administration, Finance and Audit, and Nominating.

All Board members are expected to serve on at least two committees and may be asked to attend one or more meetings or functions each month. Nominations may be made only by dues-paying members and must be submitted on an official FONZ Nomination Form with a biographical sketch of the nominee. Call 202.673.4951 to receive Nomination Forms or to discuss Board services with me or a member of the Board. The deadline for submitting nominations is July 19, 2003.

Thank you for your continued support of FONZ and your commitment to making both it and the National Zoo the best that they can be.

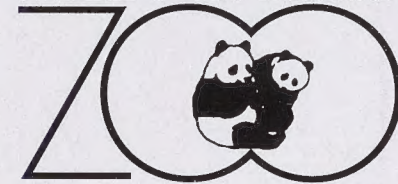
Sincerely,


Clinton A. Fields
Executive Director



P.S. Don't forget to join us for ZooNight 2003 on Friday, June 20, from 5:30 to 8:30 p.m. at the Smithsonian's National Zoological Park. This is your members-only, after-hours adventure so we hope you'll enjoy the special animal demonstrations, keeper talks, hands-on activities, and performances. You will need a reservation, so RSVP online at <http://www.fonz.org/zoonight.htm>.

Friends of the National



is a non-profit organization dedicated to supporting the conservation, education, and research efforts of the Smithsonian's National Zoo. Formed in 1958, FONZ was one of the first conservation organizations

in the nation's capital. Friends of the National Zoo is dedicated to supporting the Smithsonian's National Zoo in a joint mission to study, celebrate, and help protect the diversity of animals and their habitats.

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☉ Smithsonian **National Zoological Park** is located at 3001 Connecticut Ave., N.W., Washington, DC 20008-2537. Weather permitting, the Zoo is open every day except December 25. Hours: From April 6 to October 25, grounds are open from 6 a.m. to 8 p.m.; buildings, 10 a.m. to 6 p.m. From October 26 to April 5, grounds are open from 6 a.m. to 6 p.m.; buildings, 10 a.m. to 4:30 p.m.

Membership in FONZ offers many benefits: publications, discounts on shopping, programs, and events, free parking, and invitations to special programs and activities to make zoogoing more enjoyable and educational. To join, write FONZ Membership, National Zoological Park, Washington, DC 20008, call 202.673.4961 or go to www.fonz.org.

Membership categories and annual tax-deductible dues are:

Family (includes children 3-16 years)	\$49
Double	\$44
Individual	\$39
Senior Citizen (individual or couple)	\$25
Contributing	\$75
Sustaining	\$150
Patron	\$250
Sponsor	\$500
Benefactor	\$1000
Director's Circle	\$2500
ZooGoer (for those outside a 200-mile radius of Washington, DC)	\$25
(\$8 of membership dues goes to a ZooGoer subscription)	

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LETTER FROM THE ZOO DIRECTOR

GIANT PANDA BREEDING SEASON

With only about 1,000 left in the wilds of China, and with their incredible public appeal, the giant panda—and its endangered status—is well known to people around the world. Year-round, visitors to the National Zoo make it a point to visit Mei Xiang and Tian Tian, the pair of giant pandas on loan via a cooperative research and breeding program with China. Zoogoers who visited in March and early April had a chance to see something even more rare than a giant panda itself—giant panda breeding.

Spring was definitely in the air at the Fujifilm Giant Panda Conservation Habitat. Giant pandas have one breeding season a year, with mating occurring during a brief, one- to three-day period. The male usually begins to show signs of breeding interest (often called “rut”) weeks to months before the female is ready. This year, Tian Tian began to show signs of rut—increased activity, decreased appetite—in early January. Mei Xiang began to show signs consistent with the approaching breeding season in early March: decreased activity, decreased appetite, and decreased willingness to “play” with Tian Tian.

Throughout this breeding season, giant-panda-house staff and Zoo scientists kept track of these behavior changes while collecting a variety of samples to help monitor the reproductive state of each panda. Scientists were able to use data collected last year from these pandas to predict when Mei Xiang’s estrogen would rise and peak, and when she would ovulate. It was exciting to observe the day-by-day changes in Mei Xiang’s estrogen levels, and correlate them to her behavior, as well as Tian Tian’s.

Zoo endocrinologists reported on March 25 that Mei Xiang’s estrogen levels had begun to rise above what is considered baseline for the nonbreeding season. As the end of March neared, Tian Tian and Mei Xiang vocalized more frequently, making chirps, whines, and bleats. Both pandas increasingly scent-marked, and Mei Xiang repeatedly raised her tail and walked backwards toward Tian Tian—signs that the pair was preparing to mate. By the first of April, her estrogen levels had risen substantially, and a sharp increase on April 3 indicated that she would ovulate within 24 hours.

For two days and nights, researchers, curators, keepers, and volunteer observers kept a round-the-clock watch on Mei Xiang and Tian Tian via direct observation and video cameras located in the pandas’ enclosures. All of the behavioral signs of breeding continued during this time, with varying intensity. Then, in the early afternoon of April 4, Tian Tian and Mei Xiang mated very briefly,

for just 15 seconds. Estrogen levels examined later that day confirmed that Mei Xiang had indeed ovulated, and that the timing of the breeding could not have been better. However, mature giant panda pairs typically mate several times over the course of a day or two. In this case, the pair mated only once.

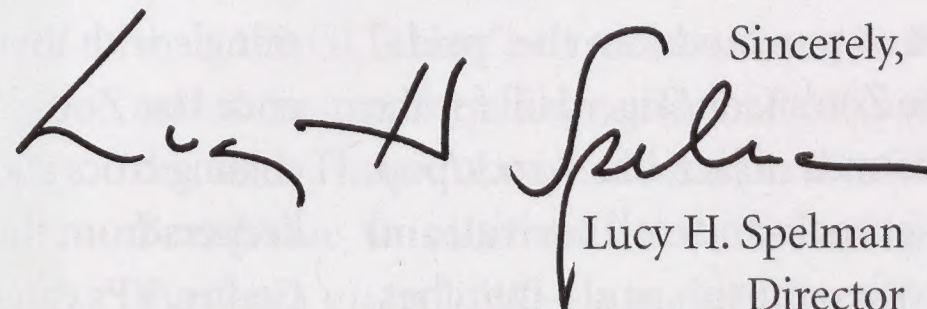
The next step is to wait, and to continue to collect data. Giant pandas have a rather unusual reproductive cycle. Two interesting traits in the female pandas are “pseudopregnancies” and delayed implantation. Giant pandas that do not conceive after ovulation experience an “obligate pseudopregnancy,” during which their hormone profile mirrors that of a true pregnancy. This makes it difficult to confirm whether the female is pregnant.

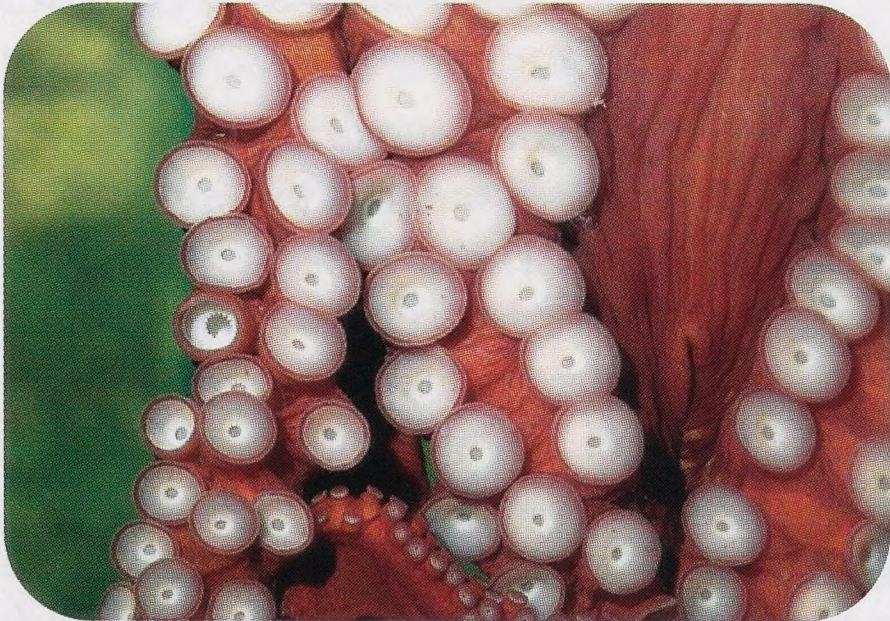
When delayed implantation—a trait found in other bear species—occurs, the embryo floats in the uterus for 50 to 100 days after conception before implanting in the uterine wall. After implantation, it might be another five to six weeks before a cub is born. As a result, even though all giant panda cubs are born at the same developmental stage, there is often a wide variation in gestation length, which may range from 95 to 180 days.

The big question at the Zoo these days is whether Mei Xiang will produce a cub. While it is possible that this first mating was a success, it is more likely that these young giant pandas need more time to mature, including more time to learn and adjust to the behavior changes associated with the breeding season. Both Mei Xiang and Tian Tian are still very young; she is approaching her fifth birthday, while he is approaching his sixth.

This gives us more time to study and understand several fundamental questions remaining about this species. At what rate do they mature? At what age do they naturally breed? What kinds of behavioral and hormonal changes will they show each year as they age? How can we predict and monitor pregnancy?

These questions—and many more—must be answered soon about giant pandas if we are going successfully to conserve and protect this endangered species. While it may seem like a race against time, it is also extremely exciting.

Sincerely,

Lucy H. Spelman
Director
Smithsonian's National Zoological Park



J'NIE WOOSLEY / NZP



J'NIE WOOSLEY / NZP



J'NIE WOOSLEY / NZP

»»ANIMAL NEWS

The Smithsonian's National Zoo has a new male peacock (*Pavo cristatus*) to replace one that was preyed upon last year by a local fox. You can see him in his sartorial splendor throughout the year—though, from time to time, he dresses down, shedding his display feathers during periodic molts.

This largest member of the pheasant and turkey family is a powerful animal, but a somewhat weak flier. Peafowl are omnivorous and spend much of their time foraging for plants and small animals. On your next visit to the Zoo, you may notice the shrieking cries and honks of the peafowl, calls used to attract mates and to alert others to danger. The Zoo's new three-year-old peacock comes to us from the Philadelphia Zoo.

The giant Pacific octopus (*Octopus dofleini*) can grow to 30 feet in length and weigh more the 100 pounds. Perhaps in anticipation of the inevitable, the Zoo moved its resident 18-pound octopus into a new 500-gallon tank that is twice the volume of the old tank and provides an enriched habitat for what is likely the most intelligent of invertebrates. Octopi can solve problems and learn from their experiences, repeatedly solving the same problem and extrapolating the solution to similar situations. For those of you

who can't make it down to the Zoo anytime soon, the new octopus cam at <http://nationalzoo.si.edu> is just one of a number of new cameras that allow virtual visits to our exhibits.



The Zoo's hand-reared, eight-year-old female maned wolf, Reynita, had a litter of four pups on January 29. This is Reynita's first litter, and although she was raised in captivity she has excellent parental skills. Another female, Louise, had three pups in early December, which she and her pair-bonded mate, Chochise, are raising. The American Zoo and Aquarium Association's Species Survival Plan had recommended both females for breeding this year. This species of canid is native to the grasslands of south-central Brazil.

»»ZOO HAPPENINGS

FONZ's annual summer concert series, Sunset Serenades, kicks off on Thursday, July 3. Through August 14, come out on Thursdays from 6:30 to 8 p.m. and join the "pride" on the Zoo's Lion/Tiger Hill for the cool sounds of jazz, blues, rock/pop, reggae, rock-and-roll revival, and patriotic music and marches. Admission is free. Check it all out at the new Zoo/FONZ website at <http://www.fonz.org> for the latest schedule.

FONZ Young Professionals can come out and "Croc the Casbah" at the first of our YP After-Hours

events. Taking place on Thursday, June 19, from 6 to 9 p.m., "Croc the Casbah" will give young professionals from the Washington, D.C., area and beyond the opportunity to mingle with their peers and experience the Zoo at night. While discussing crocs and other reptiles with keepers from the Reptile Discovery Center, YPs can dance to the musical hits of the 1980s and enjoy the hors d'oeuvres of a local restaurant and the beverages of our cash bar. Tickets, which include food and snacks, are \$8 at the door for FONZ YP members and \$10 for non-members. There is a discount for

ordering tickets by 2 p.m. the day of the event. Other YP After-Hours events this year include the disco themed "Won't You Take Me To... Monkey Town" on August 21 and "I Get a Kick Out of Shrew," featuring big-band music and fox-trot lessons September 18.

This year's ZooNight, FONZ's special members-only evening at the Zoo, will be held on Friday, June 20, from 5:30 to 8:30 p.m. This is a special opportunity for the whole family to explore the Zoo after hours.

The Zoo will welcome the D.C. Youth Orchestra Program on

Sunday, June 1, for the last of three chamber-music performances to be held at the Zoo in 2003. Led by Music Director Lyn McLain, the orchestra has performed in 20 different countries since its inception in 1961, and last year was one of only 11 out-of-school arts programs to be honored with The President's Committee on the Arts and the Humanities' "Coming Up Taller" Award. The free concert will take place in the Zoo's Visitor Center Auditorium from 4 to 5:30 p.m. and will feature the program's brass, string, harp, woodwind, and virtuosi chamber groups.

>>NEW ZOO-FONZ WEBSITE

The National Zoo and FONZ have launched a new joint website at <http://nationalzoo.si.edu> and <http://www.fonz.org>. With more than 2,000 pages detailing everything from the park's hours of operation to Zoo research into reproductive science and zoological medicine, the new website is a comprehensive resource for visitors, scientists, and those interested in getting involved with the Zoo and FONZ. A host of exciting new webcams can also be found on the site, featuring a variety of Zoo residents including black-footed ferrets, gharials, flamingos, and many others. Be sure to visit often and check out what's new.

>>VOLUNTEER CORNER

If you have ever been down to Beaver Valley in the midst of a rainstorm and seen soaking wet volunteers staring into the trees, you have happened upon our dedicated golden lion

tamarin monitors. From May through October each year, a family of golden lion tamarins (GLTs) roams freely in a hilly, wooded section of Beaver Valley. They make their home in an Igloo-brand cooler high in the trees and spend their days napping, playing, and foraging for food, all under

GOLDEN LION TAMARIN (*LEONTOPITHECUS ROSALIA*)

the close supervision of volunteer monitors. The GLT monitors record behavioral data on the monkeys from 7 a.m. to 7 p.m., seven days a week for the entire season. Last year, more than a hundred volunteers participated in the program, and the monkeys certainly gave them a run for their money! In addition to spending time in Beaver Valley, the GLTs were often seen in the trees in the rhino yard, the singing dog yard, and the crane yards. In the wild, GLTs tend to stay within a few acres of their nest box, but the free-ranging tamarins at the Zoo are all equipped with radiotracking collars in case they stray out of volunteer eyesight.

Golden lion tamarins come from the rainforests of eastern Brazil, and are highly endangered. The Zoo's golden lion tamarin project began in 1986 to help educate the public about these small monkeys, and to serve as a training ground for GLTs. In the early years of the program, at the end of each free-ranging season, the participating GLTs were reintroduced to the rainforests of Brazil to help support the dwindling numbers of wild-born GLTs already there. The program has been incredibly successful. More than 150 GLTs have been reintroduced to Brazil, and those monkeys have since had offspring in the wild. There are now more than 400 GLTs in Brazil due to reintroduction, bringing wild numbers up to 1,100—a major increase from years past. In fact, the program has done so well that there is currently no more space left to reintroduce GLTs to Brazil!

Right now you can view the Zoo's collection of GLTs at the Small Mammal House. For more information on this program, or to volunteer, please call 202.673.4964.



JESSIE COHEN / NZP



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CATTLE GRAZE IN THE OPEN DEHESA OF SIERRA DE BERMEJA, WESTERN SPAIN (TOP); BARK HARVESTED FROM CORK OAK (*QUERCUS SUBER*) AND HOLM OAK (*QUERCUS ILEX*), INSET AND BOTTOM, RESPECTIVELY.

BY MALCOLM SMITH

WHAT PULLING A REAL CORK CAN DO

Next time you open a bottle of French champagne or Spanish rioja, pay a little more attention to the cork. That inconsequential-looking bottle stopper may be the key to the survival of one of the richest wildlife habitats in Europe. Called “dehesa” in Spain and “montados” in Portugal, it stretches over roughly 13,000 square miles of undulating land in western Spain and eastern Portugal. Bread-oven hot in midsummer, ice-cold in winter, the habitat is a patchwork of evergreen holm oaks and cork oaks, which grow on flower-speckled summertime grasslands dotted with aromatic shrubs and a sprinkling of cultivated cereals. A bit like the savanna of central Africa, each acre of dehesa supports from 15 to 50 or so trees.

The cork oaks, the thick bark of which is harmlessly stripped off every decade for cork production, are the economic backbone of the dehesa. No fewer than 13 billion cork bottle stoppers are used worldwide every year, the majority made from Spanish and Portuguese cork.

But the traditional use of cork for stoppering wine bottles is under threat from the growing use, particularly by New World vintners, of plastic “corks.” If plastic gains a substantial market share, the dehesa/montados habitat could be doomed.

“Dehesa is vital to the continued existence of birds such as the Spanish imperial eagle, its world population only about 170 pairs; the black vulture, Europe’s largest bird of prey; and the rare black stork,” says Mario Díaz, Associate Professor of Zoology at Castilla La Mancha University and a dehesa expert.

Wildcats, Iberian lynx, and the more widespread common genet—a small, long-tailed, cat-like mammal sacred to the ancient Egyptians—patrol the dehesa at night, hunting for smaller mammals and birds. A few packs of wolves, and an occasional giant-sized eagle owl, do the same.

CULTIVATED WILDERNESS

Walk in dehesa early on a spring morning and the sun, a golden globe on the horizon, suffuses warmth and light. Mist rises between the olive-colored oaks as the dew of the cool night slowly evaporates. The trees cast long shadows like rows of giant soldiers.

The serin (*Serinus serinus*), a finch with a canary-yellow chest, starts its jingling song—like tiny splinters of falling glass—from the topmost branch of an oak. Soon, greenfinches (*Choris* sp.) join in with their mellow cadenzas, competing with the roller-coaster pitches of woodlark



(*Lullula arborea*) songs. A flash of blue and cinnamon, coupled with some harsh shrieks, gives away a posse of azure-winged magpies (*Cyanopica cyana*) as they zoom in follow-the-leader flight from the low branches of one tree to the next.

Another chorus begins. Gathering metronome-like pace, cicadas—large, brown-winged insects—begin their incessant chatter in one tree, then another, ceasing only when the cold of night returns.

In the distance, an exotically colored hoopoe, all pink, black, and white, shouts the “poop, poop” call from which its name is derived. Large black ants begin their first forays of the day while shrew-sized, brown, furry spiders scuttle around their burrows.

Vivid blue grape hyacinths (*Muscari neglectum*) and rose-pink gladioli (*Gladiolus illyricus*) contrast with little purple irises called Barbary nuts (*Gynandris sisyrinchium*), giving the green tablemat of turf under the trees a pointillist speckle of colors. On the warming ground, a scattering of dead branches is pockmarked with the burrowing of a myriad of wood-dwelling insects.

SUSTAINABLE USE

The dehesa landscape is a product of human activities, but its origins are not entirely clear. In the turbulent 16th century, when the Conquistadors—Francisco Pizarro, Hernán Cortés, Francisco de Orellana, and others—were destroying the ancient Inca and Aztec civilizations, an army of peasants was cutting down the primeval forests of Extremadura, today the westernmost region of Spain.

But the Extremeños were more selective than their brother Conquistadors in their logging. Creating land for grazing sheep, the peasants understood the importance of leaving some trees to provide summer shade for their livestock.

No one can be sure whether the dehesa was created entirely by such selective tree removal. In places, forests may have been set on fire—an easy task in the blistering summer heat when every scrap of vegetation is dry tinder—and the burnt ground planted with holm and cork oaks.

The world over, farming has become more and more intensive, especially in the last half century. Much greater use of fuel and machinery, together with artificial fertilizers and pesti-

cides, has cast doubt on the sustainability of many agricultural practices. But in the dehesa, farming practices have changed little in centuries.

“Dehesa farming is a sustainable land use,” argues zoologist Díaz. “The farms average about 1,500 acres in size. They grow a little cereal in more open areas, usually oats or barley suited to drought, and use little or no fertilizer. Elsewhere, livestock are grazed.”

Locals commonly graze sheep and, less so, goats. Farm-raised deer necessitate the construction of high fences to keep them contained. Cattle are common too. Red-brown or black fighting bulls frequently become the *toro bravo de la corrida*, a controversial spectacle that nevertheless remains popular.

Then there are the pigs—delightfully small and almost black pigs, which are the descendants of wild boar. The pigs roam in small herds and feast on the copious quantities of acorns that fall in autumn. The ham they produce—Jamón de Bellota—is flavored with the taste of acorns and commands high prices, both in Spain and abroad.

To provide extra browse for livestock, people regularly prune the dehesa trees. The cut branches are left on the ground for livestock to graze; larger branches are sold to make charcoal. Pruning also encourages the trees to branch outward rather than upward, increasing the area of ground they shade. With summer temperatures of almost 105° F, shade is a godsend.

Subsistence farming is an integral part of the dehesa lifestyle. Villagers still gather edible fungi for their own consumption, use rockrose bushes for firewood in their traditional stone bread ovens, and tap local beehives for honey flavored with native lavender and rosemary.

But it's the harvesting of the naturally thick bark of the cork oaks—the trees' built-in fire protection—that is the economic mainstay of the dehesa inhabitants. Cork harvesting is a skilled job, carried out using a special curved axe—a machado—wielded with extraordinary precision to make the first cuts before the cork is peeled off, rather like peeling a banana. Where cork oaks abound, the dark orange-red stems of recently harvested trees are a familiar sight.

SPANISH IMPERIAL EAGLE
(*Aquila heliaca adalberti*).

DENuded OF CORK, THE EXPOSED TRUNK OF A HARVESTED OAK STANDS OUT IN THIS BULLDOZED AREA OF SA DE ARACENA NATURAL PARK, WESTERN SPAIN.



IN THE TURBULENT
—FRANCISCO PIZARR
AND OTHERS—WERE DESTROYED
AN ARMY OF PEASANTS
EXTREMADURA, TO





**16TH CENTURY, WHEN THE CONQUISTADORS
O, HERNÁN CORTÉS, FRANCISCO DE ORELLANA,
OYING THE ANCIENT INCA AND AZTEC CIVILIZATIONS,
S WAS CUTTING DOWN THE PRIMEVAL FORESTS OF
ODAY THE WESTERNMOST REGION OF SPAIN.**



“The Alentejo and Ribatejo regions of eastern Portugal’s montados and forests produce about half of all the world’s cork while Spain’s dehesas de Extremadura and Andalusia produce another quarter,” says Eduardo Goncalves, who has produced a detailed report on the economics of cork for the United Kingdom’s Royal Society for the Protection of Birds.

Although much of the lower quality cork is used to make products such as wall tiles, vehicle engine gaskets, and sports equipment, its economic value is derived largely from the best quality bark, which goes to make wine bottle corks. But plastic “corks,” many of them made to resemble the real thing, are stoppering more and more wine bottles, especially at the cheaper end of the market. Other winemakers are starting to use metal screw-cap closures. Why?

The simple answer is cork taint. Some wines have a musty smell when you open them and are often described as “corked.” The musty smell is due to a chemical called TCA, or trichloroanisole, produced by the interaction of molds in the cork pores with traces of bleach used to sanitize the cork.

Wine experts and industry insiders quote a wide array of figures about how commonplace cork taint actually is: from less than one bottle in 100 to as many as one in 12. Much of the variation might be explained by how severe the taint actually is, anything from a foul, wet-carpet odor at its worst to a wine in which the taste is flat or dull. Variation also depends on the person doing the tasting. Discerning wine quality is an art, not a science.

Some wine-industry insiders are critical of the cork producers’ complacency in assuming that wine drinkers are willing to accept the occasional bottle of tainted, and sometimes undrinkable, wine. They claim that the producers have underestimated the problem and rely on the continued use of cork stoppers merely because they are the traditional means of sealing bottles.

But the cork producers in Spain and Portugal are waking up, hit by a decline in their bottle-cork market and negative comments in such prominent publications as *The Times* of London. In May of 2002, APCOR, the Portuguese Cork Association, announced a \$1-million research fund to tackle cork taint.

“This initiative demonstrates clearly that we are dedicating the appropriate resources to finding a solution to TCA in natural cork stoppers

J. M. SIMÓN

BOB GIBBONS / WOODFALL WILD IMAGES



CORK HARVESTING IS A SKILLED JOB, CARRIED OUT USING A SPECIAL CURVED AXE —A MACHADO—WIELDED WITH EXTRAORDINARY PRECISION TO MAKE THE FIRST CUTS BEFORE THE CORK IS PEELED OFF, RATHER LIKE PEELING A BANANA.



industry-wide,” said Francisco de Brito Evangelista, director of APCOR’s International Campaign for Cork.

Even the Prince of Wales has entered the debate. “Something as apparently simple as the decision by some winemakers to use plastic stoppers instead of traditional cork can have far reaching impacts. Quite why anyone should want to encounter a nasty plastic plug in a wine bottle is beyond me,” he said when he received the 2002 Euronatur Award for his efforts to protect the environment. “The production of cork is a sustainable industry. The trees live for centuries. And the dehesas provide a rich and varied wildlife habitat. All this is under threat,” he added.

CORK ECONOMICS

According to Eduardo Goncalves, in the five to ten years since plastic corks first appeared, they have usurped up to seven percent of the bottle-stopper market. If this rise continues to 15 percent, he argues, “A surplus of cork could trigger significant price drops, causing dehesa farmers to go out of business or to consider alternative crops, such as eucalyptus trees that grow well in the climate of the western Iberian Peninsula.”

As a wildlife habitat, however, eucalyptus is a disaster. Although it attracts lower government subsidies than planting dehesa trees, eucalyptus can be harvested within a decade. Quality cork can’t be harvested until an oak is half a century old.

“In all the Mediterranean regions, native forests are being replaced with non-indigenous species,” says Clara Landeiro of World Wildlife Fund. “They’re not the right trees for the conditions. They suck up water from the soil, take all the nutrients, and don’t give anything back.” Landeiro warns of desert creeping north as the soil becomes incapable of supporting plant growth. Global warming could make the threat even more severe.

A major slump in the quality cork market would jeopardize the jobs of some 40,000 cork harvesters and processors in Spain and Portugal. It would also substitute a synthetic product whose production consumes large amounts of chemicals and energy for a natural and biodegradable one. If sustainability were ever to be translated into practical reality, cork would win every time.

But not all conservation organizations agree that plastic stoppers pose such a problem. “Even though cork exports have declined slightly, the

area of montados in Portugal has expanded a little since the 1980s because young trees have been planted with government or European Union cash support,” suggests José Martins of Quercus, Portugal’s largest environmental non-governmental organization.

In Spain, the cork industry claims that the dehesa area has increased by as much as 800 square miles in the last decade (a figure hard to believe), although counterclaims suggest that it has declined because of illegal tree cutting. Mario Díaz of Castilla La Mancha University believes that overall the area of dehesa has fallen.

This confusion arises for two reasons. First, there is no detailed mapping of dehesa from which its area can be accurately measured. Second, the limits of the habitat are very difficult to define because its trees become more and more scattered until they give way entirely to pasture or arable croplands.

National and regional laws in Spain and Portugal forbid the cutting or digging out of dehesa/montados trees. Authorization to do so is rarely given, except when trees are dead or diseased. But, rumors abound that trees are sometimes removed or cut under dubious circumstances to make way for more productive crops or for real estate.

More important, perhaps, is the protection that the two countries, as member states of the European Union, will be obliged to give to large areas of dehesa to implement the EU’s Habitats Directive. Dehesa is included on the directive as one of the most important habitats requiring conservation measures in Western Europe.

Dehesa protected by the directive cannot be cut unless the land is required for reasons of overriding national importance. Even then, the EU is likely to insist on the member state replanting elsewhere to create a similar—or greater—area of habitat. What’s more, the member state has to ensure that any dehesa protected by the directive, whether privately owned (as most is) or in public ownership, is protected and managed to guarantee its long-term survival.

To date, the Spanish government has proposed 1,850 square miles of dehesa, and the Portuguese

government 460 square miles, for protection under this directive. That comprises about 18 percent of the total habitat that exists in the two countries. According to a European Commission spokesman concerned with the directive’s implementation in the two countries, the two governments are going to have to increase the area given such protection before agreement with the EU is reached.

It’s easy to see why dehesa is such an important wildlife habitat. “Up to 60 different plant species can be found in a square yard of dehesa turf,” says Mario Díaz. “More diverse communities of butterflies and small birds are supported by the habitat, too, than by neighboring woodland and grassland. Dehesa with scrub—lavenders, brooms, and halimium—tend to have more warblers and blackbirds, while those with areas of cereal crops attract crested larks and corn buntings.”

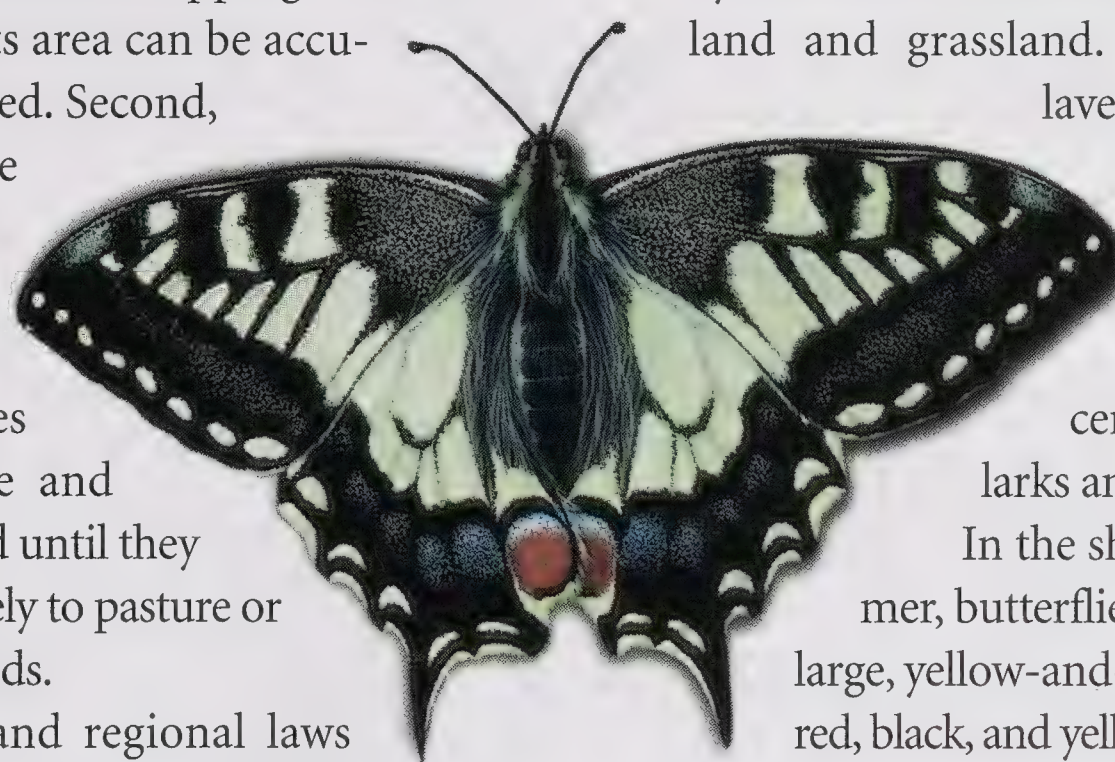
In the shimmering heat of summer, butterflies skip between the trees: large, yellow-and-black swallowtails (left); red, black, and yellow Spanish festoons; and, sometimes, gorgeous green, burnt-orange and black cardinals looking for thistles to feed from.

In winter, when frosts and cold winds bite, the dehesas are hearth and home to most of northwestern Europe’s 60,000 common cranes (*Grus grus*). There are few natural sights more impressive than a group of these stately birds, nearly four feet tall with tails reminiscent of an Edwardian lady’s bustle, walking serenely between the oaks feeding on acorns.

At this quieter time of year, too, a vast army of other northern European breeding birds—including masses of robins and black redstarts—are camped out in the trees where many insects keep the birds fed.

Conserving this magnificent habitat is easy enough, even if you live a world away from Western Europe’s dehesas. If you are sipping champagne at your birthday party, or having a bottle of red wine at your favorite restaurant, insist on a bottle stopped with real cork, and then raise your glass to sustainable agriculture. Salud!

—Malcolm Smith is Chief Scientist and Senior Director of the Countryside Council for Wales. He writes regularly in *The Times* and other national papers in the United Kingdom.



A. HAMER



uring the 12th century, the Royal Forest of Sherwood stretched up to 30 miles from Nottingham to Worksop, spanning at least 100,000 acres. The forest's most famous denizen, the generous bandit Robin Hood, may have haunted the shadows of this exclusive hunting, timber, and grazing area. Many thieves did.

While Robin Hood's existence remains questionable, there is no quibbling over that of Sherwood Forest.

In November 2002, the British environment agency English Nature announced the establishment of the Sherwood Forest National Nature Reserve (NNR).

At about 500 acres, the reserve is hardly big enough to hide a notorious bandit such as Robin Hood. But he probably would have felt at home

The UK's
Topsy

BY HOWARD YOUTH



Turvey Wildlife

in the shade beneath the reserve's 500-year-old oaks. Most of these grizzled forest giants poked out of the ground after Robin Hood's time, but a few may date back that far. Many of the forest's characteristic creatures still live there, including patchily distributed birds, such as redstarts and nightjars, and bats, like the noctule.

The existence of Sherwood Forest, no matter how fragmented, highlights how things in the United Kingdom may change, but often stay at least somewhat the same. Low on space and high on populace, the UK is an Oregon-sized country packed with 60 million people. As its population grows, few acres escape the notice of developers or businesses interested in turning green to pounds. This was not always so. Oak and ash forests once blanketed large areas of what is now England. Centuries ago, hunters stalked brown bear, wild boar, wolves, and European beaver, species that were either gone or on their way to local extinction by the time of King Richard the Lionhearted in the 12th century. Further back, Neolithic hunters also tracked moose, wild horses,

tographing is part teetering ark, part exotic menagerie. As the country's population has grown through the ages, and as increasingly modern farming and construction transformed its forests, heaths, and moors, its characteristic wildlife—most obviously its mammals and birds—also changed, sometimes in surprising ways.

WINGS OF CHANGE

Widely known as introduced pests in the United States, house sparrows and European starlings receive more positive attention in the UK, where they are appreciated as a declining part of British natural heritage. In fact, for the first time, both just hopped onto Britain's list of declining species. Over the past 25 years, British populations of each species dropped by more than 60 percent. Many other species have joined the troubled flock. In the journal *British Birds*, a 2002 report listed 65 percent of UK species (161 out of 247) as falling under some category of conservation concern, rating either "red" or "amber" status. Only 35 percent (86) fell under the "green," or steady and stable, category.

Other suburban birds seem on the wane. In 1906, Charles Stonham wrote in his 20-part treatise *The Birds of the British Islands*: "The hedge-sparrow is almost as well known as the robin and is met with in orchards, gardens, and shrubberies, but especially along the hedgerows in the neighbourhood of houses." This smoky-gray and brown backyard bird, now called the hedge accentor or dunnoek, has declined by more than

40 percent over the last 25 years. Even the black-bird—closely related to our American robin and occupying a similar niche—declined by 22 percent over the same time period. As British houses become more tightly packed together, gardens are shrinking and farmland is far less common. Even backyard and town birds seem to be feeling the pinch.

Declines in traditionally common farmland birds have been even more dramatic. For example, the populations of the once-common gray partridge have shrunk 84 percent over the last 25 years. That of the beloved skylark dove 55

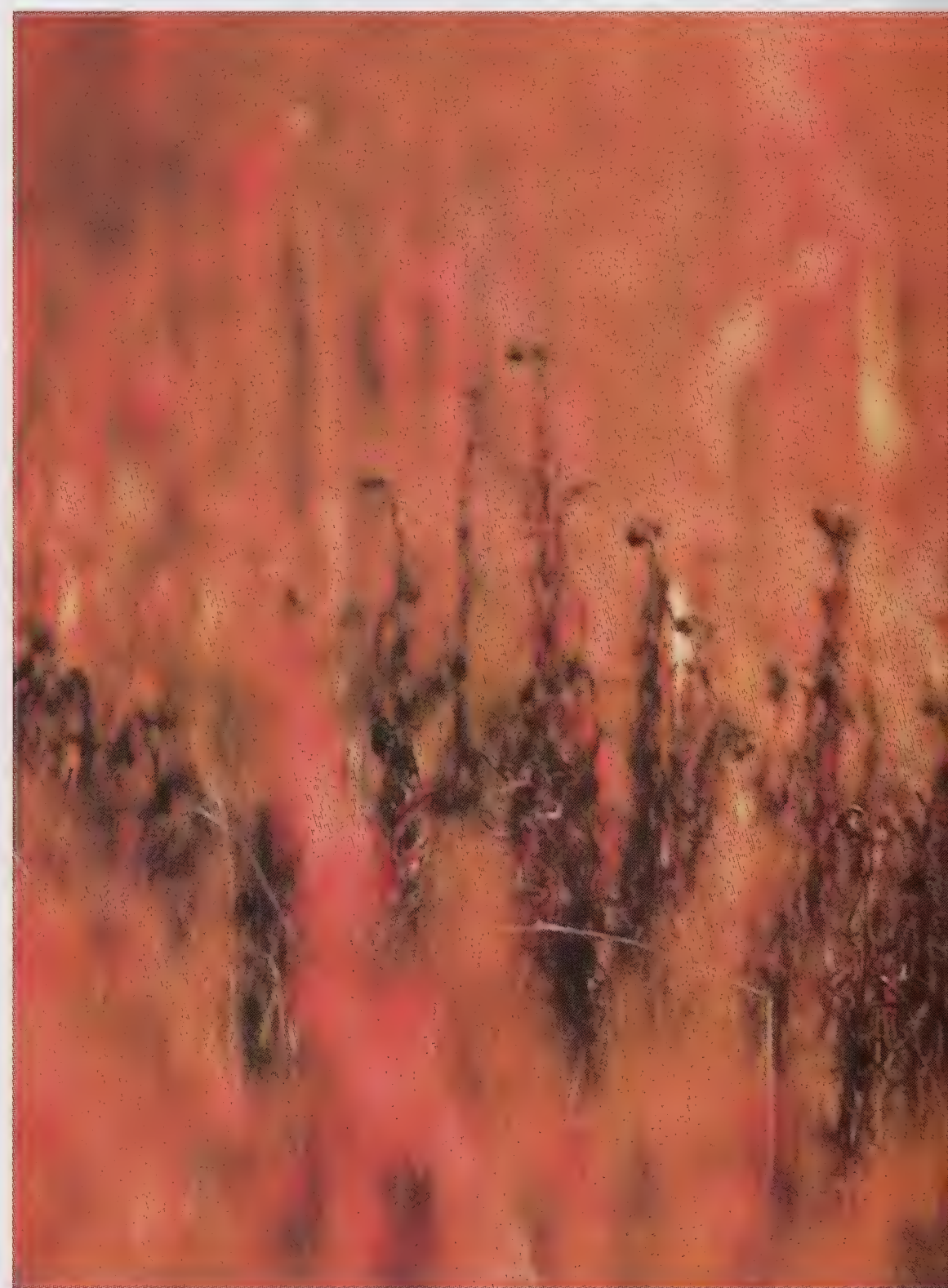


MIKE LANE / WOODFALL WILD IMAGES

HEDGE ACCENTOR OR DUNNOCK (*PRUNELLA MODULARIS*).

reindeer, lynx, and cattle called aurochs (a wild progenitor of domesticated cattle).

After centuries of domination over the landscape, the British greatly appreciate and value their remaining countryside and wildlife. However, the fauna they enjoy watching or pho-



percent over the same time period. These declines parallel similarly dramatic landscape changes. Southern England's forests were largely cut during prehistoric times, replaced by botanically diverse meadows used to grow hay for livestock and, later in the year, crops. Hedges, often planted to mark boundaries and keep livestock contained, became another hallmark of the British countryside. A



NATIVE EURASIAN RED SQUIRREL (*SCIURUS VULGARIS*).

NEIL MCINTYRE / WOODFALL WILD IMAGES

ter-planted fields provide ideal nesting habitat in spring.

Some birds still common in mainland Europe have disappeared, or nearly so, from Britain. These

include the red-backed shrike, a predatory songbird that before World War II—according to the *Book of British Birds*—“nested in almost every

have returned after long absences. British raptors, for example, have fared better in recent decades. A common scavenger during medieval and Elizabethan times, the agile red kite was ubiquitous, even soaring over London's trash-strewn streets. Hunting, pesticides, poisoning, and habitat loss—along with a shorter supply of open dumps and dead livestock—sent populations of this reddish raptor into a tailspin. In the 1970s, only about 30 held out in remote sections of Wales. The situation is far different today. Thanks to better conservation, the return of some forested habitats, and better pesticide and poisoning controls, the red kite population has topped 400 birds. A ban on DDT and better protection from shooting and egg collecting, a fading hobby in Britain, also helped osprey, merlin, and marsh harrier populations more than double over the last 25 years. Buzzards—hawks closely related to our familiar red-tailed hawk—and sparrowhawks—bird-hunting hawks similar to our sharp-shinned and Cooper's hawks—are also on the way up.

For decades, British conservationists have been trying to protect the country's rarest habitats and birds—wetlands, open habitats called sandy and shrubby heaths, and oak forests top their target lists. Government and nongovernmental organizations have set aside networks of protected areas and, as a result, populations of some struggling species started to rebound. Among the UK's recovering rare birds are a meadow-dwelling rail called the corn crake and an odd, streaky, long-legged bird of dry stretches of eastern England called the stone curlew. Both species are making a comeback thanks to restoration efforts that have expanded their territory.

EUROPEAN STARLING (*STURNUS VULGARIS*) DISPLAYING ON A SPRING OAK.



NATIVE ROE DEER (*CAPREOLUS CAPREOLUS*).

DAVID MASON / WOODFALL WILD IMAGES

rich mix of field and woodland edge species thrived in these habitats for centuries.

However, after World War II, the bucolic British countryside came under attack: More than 120,000 miles of hedge fell to development or to clear the way for modern farm machinery. The switch from traditional countryside to densely packed suburbs, cities, and huge machine-harvested farm fields continues to fuel bird declines. Modern farms have become even less hospitable to birds thanks to heavy pesticide and fertilizer use, and the practice of planting in spring rather than in winter. Undisturbed, win-

English and Welsh county; today there are only about 150 breeding pairs....” That was 1973. Today, only a few pairs nest in Great Britain, although across the channel these birds are still common, but declining due to similar land conversion. Bunched into small areas, island birds tend to decline faster than mainland populations. This factor likely came into play with the British shrikes and other birds that are now locally extirpated, including the nightingale and the great bustard.

But the news about British birds is not all bleak. Some species are bouncing back and some



RUPERT BUCHELE / WOODFALL WILD IMAGES



TALL ORNAMENTAL BLACK POPLAR TREES ATTRACT MIGRANTS TO NEST IN THE UK. THIS SPECIMEN, THE TALLEST NATIVE BLACK POPLAR IN BRITAIN (*POPLUS NIGRA*), GROWS ALONG THE RIVER LONGNOR HALL, SHROPSHIRE.

The ranks of the shy, wine-colored Dartford warbler, a resident songbird that lurks in southern England's thorny heaths, doubled over the last 25 years. Ninety percent of this wren-sized bird's population now falls within designated conservation areas, which may be either private lands or wildlife sanctuaries. The return of this nonmigratory species may be aided by recent warmer winters. Extreme cold can kill off a large portion of England's Dartford population, which sits at the northern limit of the species' range.

Annual migrations mean that change is always in the air. Migratory birds, intrepid travelers and consummate opportunists, often drift to the British Isles thanks to strong air currents and storms. In fact, as British bird-watchers will tell you, the British Isles are a fantastic magnet for annual influxes of wayward Asian, European, North American, and African migrants. If conditions are right, some of these birds may even settle in to establish nesting populations. For example, a few common crane pairs now nest in England. Regular migrants, cranes have not bred in England since the 1600s. Today, European crane populations are rising, thanks to better protection from hunting and other conservation measures. The few English pairs also benefit from careful protection that was lacking centuries ago.

The widespread planting of tall, ornamental black poplar trees attracted another migrant to nest in the UK. For the last 20 years, up to 30 pairs of golden orioles (*Oriolus oriolus*) have thatched together their hanging nests in the columnar trees. The striking yellow and black songbirds are not related to the Baltimore oriole (*Icterus galbula*), but our species did get its name from the former.

EXOTIC BIRDS: A MIXED WELCOME

Some of Britain's most common birds did not arrive on their own steam. Now a symbol of the quaint British countryside, the ring-necked pheasant actually hails from Asia. The Normans probably introduced the first of these hardy fowl, although some people discredit the Normans, claiming that Romans introduced pheasants. Regardless, by the 1700s they graced farmlands—and tables—across the country. Today, about 1.6 million birds live in the United Kingdom—more than in any other European country. Despite pressure from hunters and predators, such as red foxes, ring-necked pheasants continue

to thrive, mainly from the efforts of interested gamekeepers. Up to 15 million captively hatched pheasants are released each year to provide hunters with quarry, ensuring a good supply.

The ring-necked pheasant's elegance pales when compared with the flash of the red, gold, yellow, green, and blue of the golden pheasant, a central Chinese native now found scattered across Britain. There, up to 1,000 pairs breed, mainly in pine plantations, which in many areas are an introduced habitat that replaced the native deciduous woods. Golden pheasant populations in China are probably declining due to habitat loss, leading some conservationists to write that Britain's population is therefore of some conservation importance. A far smaller population of the spectacular Lady Amherst's pheasant, also a native of Asia, lives in eastern England, thanks to its introduction in the late 1800s. These birds were apparently named for the wife of a governor general and viceroy of India, who sent some of these birds back to her homeland in the 1820s. Today, the British population of this elegant bird is barely self-sustaining.

Many Britons have taken another colorful group of birds—waterfowl—under their wing, collecting individuals of many species found worldwide. In some cases, this hobby provided a springboard for exotic geese and ducks that settled in and became troublesome additions to the avifauna. Canada and Egyptian geese breed in many parks, clipping grasses short, littering the area with their abundant droppings, and sometimes discouraging other species from nesting near them.



MANDARIN DUCK MALE (*AIX GALERICULATA*).

MIKE LANE / WOODFALL WILD IMAGES

ple is the mandarin duck, a close relative of our wood duck. With a glowing orange face and shield-like ornamental feathers jutting from its sides, the male mandarin is among the world's most dazzling ducks. Some Britons celebrate the presence of these dapper ducks in their country. In 1997, biologist Christopher Leverwrote of the British population of gaudy mandarin duck: "The British population is of major conservation importance, the total of circa 3,500 breeding pairs...equaling that of Japan, and

surpassing that of the rest of Asia." But many British conservationists don't agree with Lever, claiming that exotic species can harm native species and should not be encouraged. In "The Population Status of Birds in the U.K.," a report published in the journal *British Birds* in 2002, the compilers wrote, "We see no compelling reason to attach conservation concern to [introduced] species in a UK context. Indeed, if these species have conservation problems, then the appropriate response is to address the causes of these within their native ranges." They specifically place the mandarin and the pheasants in this category.

But a grapefruit-sized North American duck has caused an even greater stir. The ruddy duck (*Oxyura jamaicensis*) escaped UK waterfowl collections in 1953 and established itself in the wild by 1960. Since then, it has emigrated to mainland Europe, where it now hybridizes with threatened, and closely related, white-headed ducks (*Oxyura leucocephala*) in Spain. More than

500 ruddy pairs now nest in the UK. The birds disperse widely after nesting, popping up in many European nations. New European legislation aims to curb ruddy duck numbers through hunting. In Spain, ruddy ducks have been shot on sight for years to protect fragile white-headed ducks from genetic swamping.

CENTURIES AGO, HUNTERS STALKED BROWN BEAR, WILD BOAR, WOLVES, AND EUROPEAN BEAVER, SPECIES THAT WERE EITHER GONE OR ON THEIR WAY TO LOCAL EXTINCTION BY THE TIME OF KING RICHARD THE LIONHEARTED IN THE 12TH CENTURY.

Some British conservationists squabble over the worth of their exotic additions. One exam-

As in the United States, many Britons attract and feed backyard wildlife. As American wildlife enthusiasts complain about how introduced house sparrows, pigeons, and starlings hog their offerings of seed, British bird feeders berate introduced American rodents. According to British mammalogist Keith Laidler in his 1980 book *Squirrels in Britain*, prior to the introduction of the gray squirrel (*Sciurus carolinensis*), the

FURRED FOREIGNERS

According to British mammalogist Keith Laidler in his 1980 book *Squirrels in Britain*, prior to the introduction of the gray squirrel (*Sciurus carolinensis*), the

GOLDEN PHEASANT (*CHRYSOLOPHUS PICTUS*), NORFOLK WILDLIFE PARK.

European red squirrel was the only herbivorous, arboreal mammal native to the British Isles. Writers often describe the retreat of the native red (*Sciurus vulgaris*) and the advance of the introduced eastern gray squirrel as an unfair battle. Laidler is no exception: "The reds were faced with a competitor bigger and stronger than themselves, and probably also more able to adapt its behavior to suit changing circumstances." Eastern gray squirrels naturally occur through much of the eastern U.S. and some of southeast Canada. A forest-and-edge maverick, this species seasonally exploits a wide variety of foods, including mushrooms, buds, flowers, apples, acorns and other nuts, and birdseed. In general, gray squirrels have much less finicky palates than the reds.

Eastern gray squirrels were introduced to Britain repeatedly between the late 1800s and 1920s. Finding Britain a fair and fruitful land, they multiplied and spread, thriving even when seed and nut shortages drove down the smaller red squirrel's numbers. Eastern gray squirrels also

rip the bark off deciduous trees while seeking the salty tissue below. This habit hardly wins the animal any fans in Britain. While the gnawing power of an estimated 2.5 million gray squirrels may seem formidable, the rodents don't seem to cause serious damage to forests. Eastern gray squirrels have also been introduced to Ireland from England, and to northern Italy and South Africa.

The planting of pine plantations—which hold little attraction for gray squirrels—may have saved the UK's red squirrels, most of which survive in or near Scotland. "...without these sanctums," writes Laidler, "the red squirrel might already have become extinct." He adds that it would be "a zoological tragedy if we had to substitute our delicate—and unique—subspecies for the heavy-set and less attractive grey."

In the past, red squirrels also frequented deciduous woods, but gray squirrels have usurped them. In some areas, managers try

to curb gray squirrel populations through hunting, poisoning, sterilization, and other measures. The British Parliament has even debated and adopted a nationwide Strategy for Red Squirrel Conservation, an effort to boost red squirrels and discourage the disreputable grays. The aim is to control the introduced rodents' numbers, not to eradicate them.

But the gray squirrel is not the only foreign mammal causing mischief in British habitats. Just as with birds, the British have long chronicled and collected odd and interesting mammals from other parts of the world. Some they brought home and made their own. Reeves' muntjac, a German shepherd-sized Asiatic deer, hails from eastern China and Taiwan. This chestnut-colored mammal, known to science as *Muntiacus reevesi*, is named for British naturalist John Reeves, who studied wildlife in China from 1812 to 1831. Reeves sent many specimens back to British museums, but perhaps he never dreamed that the exotic deer he described in Asia would haunt the rolling English countryside by the thousands. Yet that's what happened around the turn of the 20th century, after some escaped from a herd imported by the Duke of Bedford. By the 1920s,

BILL COSTER / WOODFALL WILD IMAGES

AUSTRALIA'S RED-NECKED WALLABY (*MACROPUS RUFOGRISEUS*) LIVES A FERAL LIFE IN THE UK.

the species had a firm hoof-hold in England.

Today, more than 40,000 Reeves' muntjac live in the United Kingdom, most of them in England. There, they quietly move through woodlands, scrub, and occasionally large gardens. In some areas, you can find up to 100 per square mile. Such density has a chilling effect on other deer populations, particularly the native roe deer and another exotic, the Chinese water deer, which now inhabits marshes in eastern England. In a 1986 article in *International Wildlife* magazine, British biologist Oliver Dansie called Britain's muntjacs "...an almost innocuous asset to the countryside," adding that "they give pleasure to thousands and pain to few." Dansie enjoyed visiting with the muntjacs that lived in the woods beside his backyard. Seventeen years later, they have fallen out of favor in areas plagued with dense populations. In some areas, wildlife managers cull them, branding the Asian deer garden-chewing, flora-damaging pests.

The well-established and increasingly numerous muntjac is a newcomer compared with the fallow deer (*Dama dama*), which many Britons incorrectly consider a native species. These impressively antlered, spotted deer probably found their way to Britain thanks to the Romans or Normans. Fallow deer were also introduced to most of the other European countries, although they originate from Turkey and areas east through much of Asia.

The UK's largest terrestrial herbivore, the native red deer (*Cervus elaphus*), also ranges across much of the Northern Hemisphere. We in the United States call "our" members of this species elk (not to be confused with what Europeans consider "elk"—what we call moose). British red deer live in a variety of wooded and open habitats. Over the centuries, their bloodlines have been muddled here and there by introductions of red deer from other parts of the world. In the UK, they face a further genetic challenge from a smaller Asian elk called sika deer (*Cervus nippon*). Sika deer thrive in parts of Britain after introductions there. In some parts of Scotland, sikas are about as common as red deer. They hybridize with the native reds, further confusing genetic matters. Sika deer have also

A COMMON SCAVENGER DURING MEDIEVAL AND ELIZABETHAN TIMES, THE AGILE RED KITE WAS UBIQUITOUS, EVEN SOARING OVER LONDON'S TRASH-STREWN STREETS.

been introduced to other parts of Europe, New Zealand, some Pacific islands, and parts of the United States, particularly Texas and the eastern shores of Maryland and Virginia. If you visit Chincoteague National Wildlife Refuge, you may spot a dozen or more.

In case you lost count, that's six deer species now calling the United Kingdom home. In some areas, British conservationists seek to control large deer populations that destroy wildflowers and young tree saplings, endangering forest regeneration. Unfortunately, no large native carnivores survive to check deer numbers. Some groups lobby to reintroduce wolves to Scotland, but livestock and hunting groups, as well as local communities, rise up against them. Wolves disappeared from Scotland by the late 1700s and seem unlikely to return.

While deer thrive in the UK, the future of another exotic herbivore—the Australian red-necked wallaby—is far less secure. These small marsupials live in a few scattered feral populations in Britain, none numbering higher than 80 individuals. Between habitat fragmentation, road kills, and disturbance by livestock and people, these curiosities will likely vanish in coming years. That might be a good thing, considering that red-necked wallabies became abundant, forest-damaging pests in New Zealand after their introduction there.

From wallabies to waterfowl, the UK's exotic menagerie reflects the former reach of the British Empire and the folly and danger of introducing animals to new places. Today British conservationists do their best to balance the old with the new in the snippets of native wilderness—areas like the Sherwood Forest NNR.

There, some things remain the same. The area, at least for now, is spared the munching pressure of muntjacs, and the shy, native roe

deer minces through the woods as always. However, the squirrel dashing up the sturdy oaks is not the red but rather our familiar gray. "The most visible naturalized mammal now present within the NNR is the gray squirrel," says Steve Clifton, Sherwood Forest reserve's local conservation officer. With the reds long gone, Clifton and others don't have much bad to say about their



CHINESE WATER DEER (*HYDROPOTES INERMIS*).

new neighbor. "The gray squirrels at Sherwood Forest NNR do not pose a threat to the wildlife interest of the NNR, although there will be some localized damage to the woodland trees such as oak," he says. Such acceptance of the new order eases the way for visitors and conservationists alike to enjoy Sherwood Forest—and the rest of the remaining wild UK—for what it is now, as well as for what it once was.

—Contributing editor Howard Youth keeps watch of the British wildlife situation from his current home base in Madrid, Spain.



BY MARY-RUSSELL
ROBERSON

THE

NEW

About 2,500 elk (*Cervus elaphus*) live on the Cumberland Plateau in eastern Kentucky—the largest free-ranging elk herd in the eastern United States. If that surprises you—well, it should. After all, until 1997, there hadn't been a wild elk in Kentucky for 150 years.

As many as 10 million elk roamed the North American continent in pre-colonial times. Their numbers began to decline after settlers moved in and began hunting big game and clearing land for farms. John J. Audubon wrote in 1847, "When we first settled in the state of Kentucky [1810], some of these animals [elk] were still to be met with; but at present we believe none are to be found within hundreds of miles of our...residence."

ELK ON THE BLOCK

By the early 1900s, elk survived only in remote areas of the western United States and Canada. It is the offspring of these animals that now live in Kentucky. (The subspecies that originally lived in Kentucky, *C. e. canadensis*, is extinct. The reintroduced elk is a western subspecies: *C. e. nelsoni*.) While much about Kentucky and its landscape has changed in 150 years, the new elk appear to be settling in fairly easily. And although it may be too early to judge the long-term success of the reintroduction, all signs are pointing to a healthy, growing population.

The Kentucky elk restoration project succeeded through good planning, strong partnerships, and sound wildlife-management techniques. But nothing is ever simple or tidy in any wildlife-restoration project. In the words of David Maehr, a conservation biologist at the University of Kentucky, “No matter how well you plan, something’s going to go wrong.” It’s up for debate whether anything has actually gone wrong, but things have definitely gotten confusing. Virginia has made it legal for hunters to shoot any Kentucky elk that wander over its borders. Many states have recently enacted bans on importing deer and elk—including Kentucky. And Wisconsin has extended its deer season in an attempt to eradicate deer from a two-county portion of the state.

The cause of all this alarm is chronic wasting disease, or CWD—a contagious neurological



PHOTOS BY
JOHN J. COX /
SONGDOG PHOTOGRAPHY

disease that affects deer and elk. It causes emaciation, disorientation, loss of bodily functions, and eventually, death. For decades, CWD appeared to be confined to an area centered on northeastern Colorado. Recently, however, it’s been showing up in all kinds of surprising places in the United States and Canada. And that’s got the attention of state wildlife departments, hunters, and epidemiologists across the country.

ELK RESTORATION

In 1996, Kentucky began looking into the idea of restocking elk in the state. “This was an animal that was known to live here in the past,” says Jonathan Day, a wildlife biologist at the Kentucky Department of Fish and Wildlife Resources (KDFWR). “We felt it could definitely live here again; the habitat was there; the food was there.

The only thing lacking was a natural predator, and we felt we could mimic that with hunting.” Day says that the people of Kentucky figured into the decision too: “People wanted to have elk back for viewing or hunting, or for the aesthetic pleasure of knowing the elk was back in Kentucky after 150 years.”

A feasibility study found that the most promising area for restoration was a 14-county area in the eastern part of the state. The 2.6-million-acre area was chosen for its high percentage of forest and low percentage of agriculture. “We wanted to avoid the very real potential

to have serious conflicts with farmers,” says UK biologist, Maehr. “You get 30 elk in an area and it looks like a bulldozer has been through. They’ll eat corn. They’ll eat beans. They can wreak havoc.”

The state’s department of fish and wildlife resources estimated the project would cost \$1.3 million for the first three years, which would exceed their funding. Fortunately, the Rocky Mountain Elk Foundation (RMEF) stepped in to help. The RMEF was created in 1984 by four Montana hunters who wanted to promote the survival of elk in the United States. The nonprofit group conserves habitat, educates the public, and assists with restoration projects. In addition to providing major funding, RMEF provided guidance on where to get elk and how to transport them.



ABOVE: A DEER FAWN (*ODOCOILEUS VIRGINIANUS*) MAY CARRY DISEASES AND PARASITES THAT ELK INTRODUCED FROM THE WEST HAVE NOT ENCOUNTERED. WITH NO MOUNTAIN LIONS OR WOLVES, COYOTES (*CANIS LATRANS*) MAY HAVE THE OCCASIONAL ELK REMAINS ON WHICH TO FEED (RIGHT).

The third partner in the venture was the University of Kentucky, which provided equipment and personnel. Scientists at the university have studied the movements and mortality of the herd extensively using radio collars. Graduate students have written theses about the effect of the elk on the ecology of the region. "This is the best documented elk restoration ever done," says Maehr.

Next, the partners began to contact other groups whose goodwill and cooperation would be a vital part of the project. Because only 20 percent of the land in the restoration zone is public land, KDFWR set up leases with private landowners (primarily coal-mining operations) to ensure access for release, research, viewing, and hunting.

To address the concerns of the Kentucky Cattleman's Association about the elk bringing livestock diseases into the state and of the Kentucky Farm Bureau about crop damage, the partners agreed to keep the elk out of agricultural areas, rigorously test incoming elk for disease, radiocollar and monitor the first 400 elk in Kentucky, and pick up and test all dead elk that could be located.

Finally, KDFWR held a series of public hearings to educate Kentucky citizens about the project and assess public opinion. Within the 14-county restoration zone, 99 percent of those who attended the meetings favored elk restoration. Maehr sums it up when he says, "This whole thing in Kentucky has been a wonderful partnership among a bunch of different groups—private landowners, RMEF, KDFWR, and the University of Kentucky."

BRINGING ELK HOME

Now, all that the project needed was some elk. "The first thing was to find willing partners in the west that had surplus animals, an overabundance," says Maehr. "That minimized the cost." The RMEF helped Kentucky find elk donors. The first seven elk, from Kansas, were released in Kentucky on December 17, 1997, in front of a crowd of about 4,500 people. Over the next several years, elk came to Kentucky from Arizona, North Dakota,

to test a live elk for CWD.) "After a week, we culled out animals as being suitable or unsuitable for movement to Kentucky," says Maehr. KDFWR's Jonathan Day adds, "If any of them looked suspicious, we wouldn't put them on the trailer."

Breeding success the first year was limited due to a combination of far-wandering females, few males, and high mortality following a stressful trip across the United States. However, in subsequent years, transport mortality was sharply reduced due to improved handling in the capture pens, separating large and small animals on the trailers, and better feeding and watering en route. As the herd filled out, natural reproduction proceeded apace. Today, the herd is reproducing well and calf survival rates are good.

According to Maehr, herd-living herbivores tend to be easier to restore than solitary carnivores. Elk are fairly general in their needs. The habitat in eastern Kentucky, while much changed since the last elk lived there, is still suitable. "We



Oregon, and Utah, with Utah contributing more than half of the total. (Elk were reintroduced into Utah from Yellowstone National Park between 1910 and 1925; Utah now has an elk population of about 60,000.)

Before getting on the trailer for the long trip to Kentucky, all animals were quarantined and tested for six different diseases—tuberculosis, brucellosis, anaplasmosis, bluetongue, John's disease, and vesicular stomatitis. (There is no way

call this 'restoration,'" says Maehr, "but in fact we're restoring them to a landscape that is new—an artifact for the human need for energy and coal mining." Reclaimed strip mines have made for large grassy openings among patches of woodlands. "The habitat there is in many cases undistinguishable from hillsides in Montana," says Maehr.

The original goal of the project was to release 200 elk a year for nine years (through 2006). In



MALE ELK (*CERVUS ELAPHUS NELSONI*) NOW MAKE THE CUMBERLAND PLATEAU, IN EASTERN KENTUCKY, THEIR HOME RANGE.
BELOW: PURPLE MISTFLOWER (*CONOCLINIUM COELESTINUM*).

the first five years, more than 1,500 elk have already been released. Now, with calves born in Kentucky, the herd numbers about 2,500.

During the past two deer seasons, hunters harvested 12 elk (six male, six female) in the restoration zone. “Currently it’s on a very limited basis,” Day says. “It doesn’t have much of a biological impact but it gets people in the mode of thinking that this is an animal that will be hunted.” Each year, ten permits were awarded by lottery and two were auctioned off by conservation organizations. The auctioned permits brought in tens of thousands of dollars, money that goes back into the elk restoration program. Day says KDFWR will keep the number of elk hunted at 12 per year for the next couple of years, then increase gradually from there.

CHRONIC WASTING DISEASE CASTS A SHADOW

Last November, the specter of CWD caused the state of Kentucky to institute a ban on the import of live cervids (deer, elk, and caribou).

The ban, however, doesn’t affect the elk restoration project because it is ahead of schedule. “We officially decided not to bring in extra elk last fall, primarily because it was not necessary to spend the extra time or money getting more animals,” says Day. “Natural reproduction is high enough. They’re moving along fine on their own.”



CWD is a type of transmissible spongiform encephalopathy (TSE) disease. Other TSEs are mad cow disease (in cows), scrapie (in sheep) and Creutzfeldt-Jakob (in humans). In all of these diseases, defective proteins called prions form in the brain, giving the brain a spongy appearance (hence “spongiform”). TSEs are specific to certain species or genera. Although CWD is contagious among deer, elk, and caribou, there is no scientific evidence at this point to suggest that it can spread to humans. However, several large new federally funded research projects will look more thoroughly into whether scrapie and CWD can be transmitted to humans. Research is also ongoing as to whether CWD can jump to cattle; so far

cattle living with infected deer for five years have not yet contracted the disease.

In the meantime, public-health officials are warning hunters not to eat the meat of any animal that appears sick or has tested positive for CWD, and not to eat the brain, spinal cord, eyes, spleen, tonsils, or lymph nodes of any deer or elk shot in areas where CWD exists.

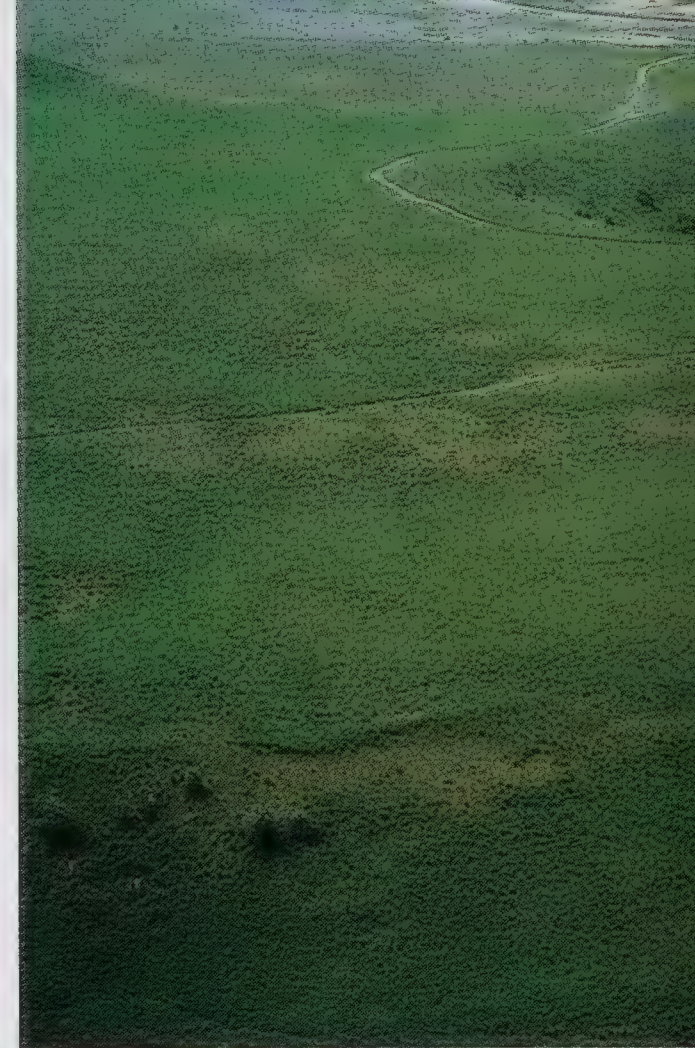
Since the 1960s, CWD has been found in an area in northeastern Colorado, southeastern Wyoming, and southwestern Nebraska. Recently, however, it has spread out of that area, affecting wild animals in South Dakota, New Mexico, Illinois, Wisconsin, and Saskatchewan, and captive cervids in Minnesota, Montana, Oklahoma, Kansas, and Alberta.

The first cases of CWD in wild cervids east of the Mississippi were discovered in February of last year, when three white-tailed deer shot in southern Wisconsin during the 2001 hunting season tested positive. Further testing found more CWD in three counties. The Wisconsin Department of Natural Resources responded by extending deer season and employing government sharpshooters in an attempt to eradicate the 25,000 to 30,000 white-tailed deer that live in the area. The department hopes the action will halt or control the spread of CWD in a state



FROM TOP TO BOTTOM: MINIMIZING STRESS DURING TRANSPORT IS IMPORTANT FOR RELOCATING ELK; AN ELK COW MEETS ITS NEW NEIGHBORS; ELK COWS CLEAR THE RELEASE CHUTE; AND, A SCIENTIST CHECKS FOR SNAILS CARRYING THE PARASITE THAT HAS PLAGUED EARLIER ELK REINTRODUCTIONS (SEE SIDEBAR).

RIGHT: OPEN AREAS CREATED BY MOUNTAINTOP REMOVAL IN COAL-MINING OPERATIONS LEAVE HABITAT THAT IS SIMILAR TO WESTERN SLOPES.



where the economy depends on deer hunting for \$1 billion a year.

Several factors make CWD hard to track and harder to control. Because there is currently no way to test live animals for the disease, diagnosis requires examination of a dead animal's brainstem. Additionally, the disease has a long incubation period, perhaps one to five years, which means it can spread undetected over large areas. A promising new study, however, indicates that live deer can be tested successfully by taking a sample of tonsil tissue in the field—a somewhat unwieldy technique in the field that is, unfortunately, not reliable for elk.

When asked if he's worried about CWD in the Kentucky elk, Day says,

"YOU GET 30 ELK IN AN AREA AND IT LOOKS LIKE A BULLDOZER HAS BEEN THROUGH. THEY'LL EAT CORN. THEY'LL EAT BEANS. THEY CAN WREAK HAVOC."

"I'd be lying if I said I wasn't. But they have yet to find CWD in any animal in the herds our elk came from. I'm worried about it in the farmed deer in Kentucky and in animals coming over from Illinois." Every Kentucky elk that dies and is found is processed and tested for CWD and other contagious diseases. None, thus far, has tested positive for CWD.

Maehr says, "If Kentucky does develop CWD it will be from somewhere else, probably through the captive population. The actual herds these elk came from were designated disease free and have maintained disease-free status." He adds, "Whether we had elk here or not, Kentucky would have to

deal with CWD." Kentucky, like many other states, established a program last fall to test deer killed during hunting season for CWD. With results back on about a third of these Kentucky deer, none have tested positive for CWD.

The spread of CWD has not followed straight lines or expected paths. For example, how did a mule deer in southern New Mexico, far from any population of cervids, come down with CWD? How did the Wisconsin white-tailed get it? Obviously, deer and elk routinely cover a lot of ground. However, humans have played a role too, by importing and exporting deer and elk for commercial game farms.

Cervid farming is common throughout the United States. Kentucky has about 50 commercial game farms. People raise deer and elk for meat production, hunting, aesthetics, or to sell their antlers for medicinal use in Asia. Day says,

"I don't think there are very many wildlife biologists out there who enjoy seeing a wild animal behind a fence. But it is a form of alternative agriculture. With tobacco going by the wayside, most lawmakers are reluctant to cast out anything that is an enterprise. We don't want to be seen as telling people they can't make a living."

Cervid farming has led to the sale and transport of animals across the United States and Canada, and around the world—animals that in some cases have been exposed to CWD. Even if it weren't for all the importing and exporting, keeping captive deer and elk often leads to outbreaks of disease—not just among the captive animals, but among their wild cousins as well. In fact, RMEF's Position Statement on Game Farming, states "... raising captive elk, red deer, and other cervids on private game farms in states



with wild, free-ranging elk populations poses serious risks to the health and viability of those wild elk herds due to the potential of disease transmission and genetic pollution from hybridization with escaped exotic game-farm animals.” The same threats apply to wild deer.

Why are captive cervids more susceptible to contagious diseases? “No one really knows the answer to that question,” says Maehr. “There may be certain social and physiological stresses associated with captivity that increase the potential of a disease like this to arise and then be maintained in the system.” What is known is that once a disease is established in a captive population, the social nature of cervids makes it easy for the disease to jump to the wild population.

The CWD scare has at least one neighboring state wishing that Kentucky would keep its elk to itself. Virginia officials estimate that 50 to 100 Kentucky elk now live in the mountains of Virginia that border Kentucky’s restoration zone. The Virginia Department of Game and Inland Fisheries (VDGIF) has made it legal for hunters with the proper deer licenses and tags to kill elk during deer season. This past fall, Virginia hunters harvested ten elk.

Allen Boynton, wildlife biologist with the VDGIF, says, “We do allow people to hunt elk during the deer season. We are not now trying to establish an elk population in Virginia. We have not made a decision *not* to do that either. We are waiting to see what happens. We’re a conservative state. Always have been.”

Virginia placed a moratorium on cervid farming in the mid-1990s. (Zoos and other exhibitors were allowed a limited amount of cervid importing, and seven fallow deer farms were grandfathered in.) This action was not in response to CWD or any particular disease. “It was just our professional judgment that transporting deer and farm-



AN ELK COW TAGGED AND RADIO-COLLARED IN ONE OF THE MOST STUDIED RELEASES TO DATE.
BELOW: CAPTURE SITE FOR WESTERN ELK, CANTON, KANSAS.

ing the deer would inevitably lead to a disease problem,” says Boynton. This fall, because of CWD, Virginia further tightened restrictions on zoos, exhibitors, and the three remaining fallow deer farms.

Boynton says, “Personally, I don’t think the likelihood is very high that the wild elk brought to Kentucky have CWD. On the other hand, because of the social behavior of elk, we are very concerned that wild elk could bring CWD from elk farms in Kentucky into Virginia.”

The KDFWR’s Day says, “Virginia has the sovereign right to make their own decisions about wildlife in Virginia. If elk wander over to Virginia and get harvested in Virginia that’s really okay because the core population in Kentucky is what’s important to the health of the Kentucky herd.”

Even in Kentucky, beginning next deer season, legal hunters can harvest elk outside of a

ten-county buffer area surrounding the restoration zone. According to Day, “We told the people of Kentucky that elk would be in 14 counties in eastern Kentucky. If they get outside of there, they’re going to cause a lot of damage to crops. For the long-term success of the project we need to keep promises and worry about taking care of the elk in the elk restoration zone. Outside of that, those elk are no longer part of the Kentucky elk project.”

While biologists, epidemiologists, hunters, and state officials worry and argue about where animals go and where CWD might pop up next, the Kentucky elk have been busy doing what elk do best—foraging, traveling, mating, and birthing. By all measures, they have adapted well to their new home.

The first six years of the project have gone about as smoothly as any restoration project

could. What could be planned for was planned for. As for what the future holds for these Kentucky elk, no one can say. According to Day, “We’re staying vigilant and hoping for the best.”

—Mary-Russell Roberson is a freelance writer living in Durham, North Carolina.





ELK RESTORATION PROJECTS AND THE MENINGEAL WORM

Any animal restoration project is a study in ecological complexity. The arrival of a new species, even if it has lived in the restoration area in the past, sets in motion a whole array of interactions. The animal's diet changes the food web. The animal's behavior changes the habitat. The animal potentially brings with it diseases, parasites, and insects that were previously unknown in the area. And the animal becomes a host to diseases, parasites, or insects that it has not encountered before.

Elk restorations in the eastern part of the United States have sometimes failed in part due to a parasite called meningeal worm (*Parelaphostrongylus tenuis*), or brain worm, which lives in the east, but is unknown in the west.

The meningeal worm is a parasite that affects white-tailed deer, elk, and other cervids. The parasite causes little, if any, damage in its usual host, white-tailed deer. But when the parasite infects elk, it is often fatal. The parasite has a multistage life cycle that begins in the feces of white-tailed deer, passes into snails and slugs, and then to deer or elk when the animals ingest an infected snail or slug while feeding. Once in the cervid, the parasite migrates to the spinal cord, and then into the brain, where it mates and lays eggs. The eggs are deposited in veins, carried to the lungs, then to the throat, where they are swallowed. From here, the eggs are shed with the feces, and the life cycle begins again. The exact distribution of the meningeal worm is unknown, but in general it occurs east of 100 degrees west longitude (which runs through the middle of Nebraska).

Elk restoration projects were attempted in ten states east of the Mississippi between the turn of the century and 1990.

Eight of these failed. These restoration efforts were not well documented, but deaths due to meningeal worms played a part in the failure of perhaps half of them. Other problems were lack of good habitat, conflicts over crop degradation, or illegal hunting. (Elk restoration succeeded in Michigan and Pennsylvania.)

Some of the restorations involved relatively small numbers of elk, and small herds are more vulnerable to problems—whether poaching, parasites, or poor reproduction due to animals dispersing too far from one another. That's one of the reasons the Kentucky project brought in so many animals. "We were using mass quantities of elk, huge numbers comparatively speaking," Maehr says. "The other restoration efforts relied on handfuls of animals to get things going. No one will ever know why they didn't make it. But when you start with a much larger group of animals they tend to do better."

Maehr is planning to study the affects of meningeal worm in the Kentucky elk, particularly those ages one to three, pending funding. "There are some hints that this parasite is more problematic in that age group," he says. "We don't know much about their ecology and demographics." At least five, and perhaps more, of the elk born into the Kentucky herd in 1998 have died of meningeal worm. These animals were not radio-collared, so the actual number may be higher.

Still, Maehr doesn't think the brain worm will spell disaster for the Kentucky elk. "There's still a question mark because of that young cohort," he says. "But all indications are that the herd continues to grow and expand."

—Mary-Russell Roberson

BOOKS NATURALLY

***Caviar: The Strange History and Uncertain Future of the World's Most Coveted Delicacy.* Inga Saffron. 2002. Broadway Books, New York. 270 pp., clothbound. \$23.95.**

I've eaten caviar but have not been impressed with its taste or the oral sensations these brined sturgeon eggs stimulate. Writer Inga Saffron has a different take: "Those who crave it will go to extreme lengths for the sensation of eggs bursting like fireworks in the mouth. All we need is one taste of caviar and we are suffused with the whisper of an ocean breeze that recalls that one primal moment when we, like the prehistoric sturgeon, were enveloped in the womb of the sea."

Many share Saffron's taste for caviar, if not her yearnings for a time when the world was new. Yet, as this fascinating book relates, caviar itself may become a thing of the past. *Caviar: The Strange History and Uncertain Future of the World's Most Coveted Delicacy* is the story of how gastronomic greed is killing the sturgeon.

The 27 or so sturgeon species represent one of the most ancient families of bony fishes, the Acipenseridae, believed to have existed for 250 million years. Sturgeon nose around in the mud and use their powerful tail to swoosh clams—or just about anything they detect with their four, fat under-chin whiskers—toward their vacuum-like mouth. "Since sturgeon never really stop growing, the older ones tend to be immense," Saffron reports. With their bodies sheathed in protective bony plates, these bottom-feeding, prehistoric-looking beasts can become huge. The record beluga sturgeon, the largest freshwater fish, weighed 4,570 pounds.

All sturgeon live in the Northern Hemisphere. There are freshwater forms but most species swim from the sea, where they spend most of their lives, to the headwaters of streams to spawn. They return to the sea as fingerlings to feed and grow until they reach maturity at the relatively late age of ten or even 20 years.

Subsequently, adult sturgeon make this trek every few years during a long life that can exceed 50 years, unlike most salmon, which die after they spawn. Like salmon, however, sturgeon return to spawn in the same areas in rivers where they hatched. Upstream dams, water pollution, altered river courses, and silted-over spawning sites have created havoc for these great fish. The relentless commercial pursuit of sturgeon for their roe to make caviar for expanding markets of caviar devotees will probably do them in.

I had never before contemplated how one would go about landing a several hundred pound fish, but, as Saffron explains, this was a problem for people when there were still sturgeon that weighed a ton or more to be caught. Cotton fishing nets are ripped by the sturgeon's sharp bony plates, so netting was not an option until nylon was invented. The bottom-feeding sturgeon don't snap at their food, so a simple baited "j" hook was not efficient. They could, however, be snagged by their constantly switching tail with a multi-barbed hook, suspended just off the bottom of a river with a float. Sturgeon don't "run" like a trout when hooked; so sturgeon fishermen just secured the line to a yoke of oxen and dragged the great fish in. This technology "...dominated sturgeon fishing from the Volga to the Danube for centuries." More recently, one-hook lines were replaced with long lines with many hooks. These

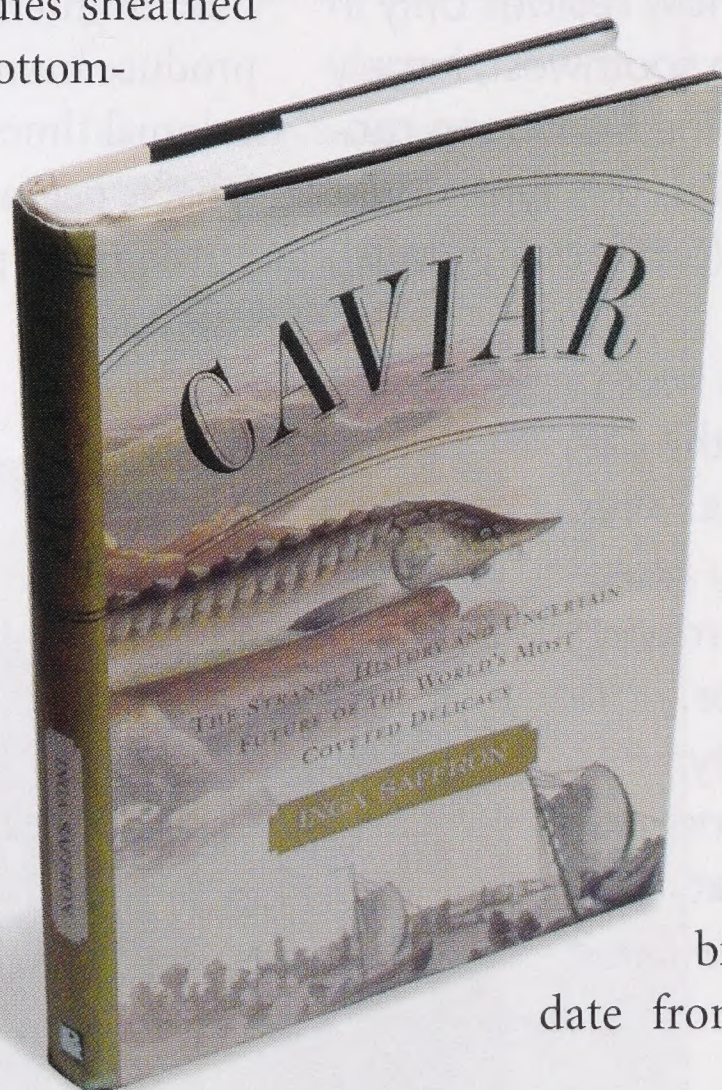
snast lines and log weirs turned sturgeon fishing into an industrial process. Today, in the Caspian region where Saffron centers her story, sturgeon are being netted while still at sea or snagged by poacher snast lines as they move up the Volga and other rivers to spawn.

Sturgeon fishing was first about its delicious meat as food; roe was discarded. The first unambiguous references to caviar date from medieval times. The

Russian Orthodox Church formally sanctioned caviar and sturgeon as food that could be consumed during religious feasts in 1280. Caviar is collected by hand, in an exacting process. Saffron reports: "The operation takes only a few strokes of the knife but unless it is done correctly the caviar will be ruined. Processing caviar requires a quick hand, good judgment, and a certain cold-blooded resolve. The fish should be gasping for breath when the knife rips down her leathery belly..." Ignoring this results in bland and mushy caviar.

Saffron's account of the last of these great fish is a nail in the coffin for the idea of a resilient and indestructible nature producing an endless bounty. In the late nineteenth century, famed British biologist Thomas Henry Huxley lectured that over-fishing was a unscientific and erroneous fear, a sentiment shared by Sasha the poacher in Saffron's story: "The Caspian sea is vast... it is impossible to exhaust the sturgeon." But we have in one area after the next—in the Mediterranean, northern Europe, and North America. The last to go is the Caspian sturgeon fishery, which was once sustained by a Russian-Iranian caviar cartel. That collapsed with the breakup of the Soviet Union in 1991. Without controls, superabundant, cheap, good caviar went mainstream, washing through world markets in the 1990s. The sturgeon are now mostly gone, caught in long drag-nets in the open Caspian Sea before they make a run for the rivers. Saffron tells how the CITES process—the Convention on International Trade in Endangered Species—is failing because, "...CITES does nothing to stop slaughter or overuse.... It is the same story with many plants and animals. Most can't survive as mass-market commodities unless they are rigorously domesticated and farmed." Investing in farming a fish that will not realize a return in roe in ten years demands a special breed of investor. Saffron describes some fledgling sturgeon-farming projects, but with a large public yearning for caviar, poachers still set their snast lines, and will continue to do so until the last wild sturgeon is hauled to shore. And caviar becomes merely a memory.

—John Seidensticker,
National Zoo Senior Scientist





A new weed-control system using sugar beet crops genetically modified (GM) with resistance to the herbicide glyphosate could be a win-win for environmentalists and pro-GM food producers, according to scientists at Broom's Barn Research Station (BBRS) in the United Kingdom. Alan Dewar a BBRS scientist says they can leave larger weeds in fields for longer periods of time, providing

food and shelter for some insects and birds. This can be done because glyphosate can handle larger weeds than traditional herbicides, and because the beet has been endowed with a gene that codes for herbicide tolerance.

This may prove particularly useful in Europe, where 80 percent of land is agricultural, and where foraging and nesting opportunities have been greatly reduced for birds. (See p. 14, "The UK's Topsy-Turvy Wildlife," which describes how common farmland birds, such as skylarks and partridges, have declined over the last 25 years.)

By spraying the glyphosate-resistant sugar beet crop rows early in the season, but not spraying between rows, scientists allowed weeds to grow in the gullies for up to 15 weeks. They used glyphosate to kill the weeds only when they became competitive with the crop. Conventional weed control for sugar beets involves killing weeds early on, as beet plants are vulnerable to higher doses of the conventional herbicides required to control larger weeds, said Dewar.

Birds benefiting the most from their approach are likely to be skylarks, finches, lapwings, and partridges, and the method could be adjusted to benefit other endangered species, such as stone curlews. Dewar said there are also more insects, a significant protein source for young chicks.

According to BBRS director John Pidgeon, "this is the first time research has shown that GM herbicide-tolerant crops can be managed for environmental benefit." Moreover, there is no sacrifice in crop yields, and similar strategies may be useful with corn and soybeans, suggesting global usefulness.

—Brendan Horton



The 2002 Red List, a World Conservation Union compilation of endangered species, has elevated the status of the Iberian lynx (*Felis pardina*) to critically endangered, suggesting imminent extinction if nothing is done to save it. Once abundant throughout Spain and Portugal, the medium-sized cat now resides only in small pockets of shrubby grasslands in the Iberian southwest, largely

due to habitat loss and to the decline of its primary source of food, the European rabbit (*Oryctolagus cuniculus*). With fewer than 300 cats left in the wild, this lynx could become the first feline to be extinct since the saber-toothed cat (*Smilodon fatalis*), about 10,000 years ago.

The most severe threat to wild lynx comes from starvation. This lynx preys almost exclusively on rabbits, which have been decimated by diseases in the last 50 years. With fewer rabbits to prey upon, the lynx population has fallen too. Habitat loss is also a great concern; the lynx prefer the shrubby grasslands and small, open forests that are characteristic of the cork-growing region of Spain and Portugal, a habitat that is in decline. (See p. 8 for more on the cork plantations, which provide ideal habitat for the Iberian lynx.)

A small zoo breeding program has yet to produce young, but conservationists say that restoring rabbit numbers is the key to saving this cat.

—Joshua Dietz

WHAT'S IN A NAME

Initially confined to the Canary Islands, both the serin (*Serinus serinus*) and the wild canary (*Serinus canarius*) have been introduced to the European mainland and now inhabit the entire continent. They are especially abundant in the cork forests of Spain and Portugal, but can also be found in Italy, France, and even Scandinavia. Although these birds are traditionally a tropical species and are considered sedentary, the northernmost populations have become migratory in response to cold winter conditions, an interesting—and unusual—adaptation.

The word "serin" is actually the French word for canary. Canary comes from the Latin "canis," which means "dog." When the Romans first visited the Canary archipelago, large, ferocious dogs inhabited one of the largest islands so it became known as Gran Canaria. Eventually, the whole chain took on the name Islas Canarias, or Canary Islands. The birds living there also acquired the name canary and became famous for their bright colors and beautiful songs.

Though wild canaries tend to be greenish yellow with brown and black streaks, selective crossbreeding of serins, finches, and other birds has allowed the creation of hundreds of varieties of domestic canaries (*Serinus canarius domesticus*), each with distinct plumages and songs. The most common domestic canary has yellow feathers, but orange, white, and red canaries have been produced. Birds have also been bred for their vocal abilities, with "rollers" emitting almost continuous, uninterrupted notes, while "choppers" produce more distinct, individual notes. Since colonial times, canaries have been a very fashionable pet in the United States and remain one of the most popular cage birds among avian enthusiasts.

—Joshua Dietz



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